

Thinking Through Sonorities in Histories of Schooling



This article uses an unattributed photograph taken around 1964 to commemorate an audio recording the junior choir was about to make at the girls' state secondary grammar school I attended as a pupil from 1958 to 1965.¹ In the photograph I am documented visually as the girl seated at the piano. At the time I was 16-17 years of age and studying the piano at the Royal College of Music in London in addition to attending school. The photograph was not conserved in the school's archive but my mother paid for it to be professionally framed. It hangs on the wall of the stairs in my house adjacent to family photos, its social biography witness to the emotional registers of women's archiving practice.

The rows of smiling but not singing girls situate the photograph as a staged event, a product of cultural discourse enshrined in a technology of display in which image-making and film-processing orchestrate vision into a text open to a diversity of readings (Grosvenor et al 2004). But photo-

¹ For girls' selective state education in 1950s England see Evans (1991).

graphs cannot be understood through visibility alone (Edwards 2012).² As I pass this photograph on my stairs, past and present entangle through bodily memories that include sounds of singing, the physicality of piano playing, and the emotion and affect that accompany musical performance and reverberate through spaces. Embodied and social relations frame the photograph as object, drawing together the visual, the auditory, the haptic, the material, the spatial and the temporal (Priem/Thyssen 2013) as they are refracted through memory, emotion, contemporary experience (Grosvenor et al 2004, 326) and Western understandings of the sensorium (Edwards et al 2006).

I use the photograph to explore research techniques³ for acoustic⁴ histories (see also Burke/Grosvenor 2011; Goodman 2017; Hoegaerts 2017; Verstraete 2017). I chart four techniques for reading the sonorities of the photograph that each draws on a different scholar's approach to the acoustic, which I outline along with links to related pedagogies. Following Edwards' (2012, 128) stress on photography as a sensorially integrated medium, each of the historians' work I discuss inter-weaves the senses (sound/sight; sound/touch/sight; sound/hearing/touch/sight), while the fourth approach focuses more explicitly on sound as vibrating material. Rather than providing an in-depth analysis of the photograph, I am interested here in what aspects of sonority the scholar's research technique brings to the fore. I then consider the various 'ensoundings' of the photograph through their implications for my positioning as researcher who is also girl-at-the-piano.⁵ I end by opening a line of thinking around change in histories of girls' education that is prompted by thinking about the photograph acoustically. I begin by outlining Leppert's research technique around the sight of sound and its implications for reading the photograph's sonorities.

1) Thinking through the sight of sound

Leppert's (1997) response to the ephemerality of sound in histories is to focus on 'the sight of sound' as 'the body labours to produce sound' (xx). Leppert argues that the slippage between the physical activity to produce musical sound and the abstract nature of what is produced creates a semiotic contradiction that is ultimately 'resolved' to a significant degree via the agency of human sight. He bases his analysis of the visual ('artistic') representation of sound on a view that images are produced so that 'their meanings will be congruent with those produced by sight and sound together in the lived experience of the original and intended viewer' (xxi). For Leppert, how performers look and gesture, how they are costumed, how they interact with their instruments and with one another, how they regard the audience, and how other listeners heed the performers all denote the musical event as socialised activity. In Leppert's account consuming music is a sight-embodied, situated activity in which the 'way of seeing' incorporates the 'way of hearing' (xxi) and the semantic intent of music (its discursive argument) configures 'complex relations between sound and hearing' that 'mediate the existence of being' (18). Leppert maintains that visual representation encapsulates this embodied activity, not as a 'disinterested' record of events but as 'a

² Thanks to Pieter Verstraete for this reference and for comments on an earlier version of this article.

³ This understanding of research technique draws on Taylor (2016).

⁴ Chambers dictionary defines 'acoustic' as producing or operated by sound.

⁵ The girl-at-the-piano is a figure around which girls' education was constructed and contested (Theobald 1996).

coherent and discursive, commonly dialectical, vision of the varied relations' within whose context, he argues, 'sound occurs and sound means' (xxi).

In focussing on the 'sight of sound' Leppert attends to the piano as 'something of a floating signifier', intended to be looked at and 'second to be heard' (119). He maps a problematic and contradictory connection in Western history between the body and music, the piano, the woman at the piano and music lessons in operating to stabilise the sign 'woman' (xxviii). Through the 'sight of sound' he frames piano-playing as a domestic pursuit denoting femininity rather than the display of public performance. Leppert supports his argument by drawing on Darwin's (1798) *Plan for the Conduct of Female Education*, which he maintains inscribed and sanctioned a split between mind and body, reason and emotion, men and women, and between a temporality seen for men as developmental and lived socially and for women viewed as non-developmental and expressive of a stationary time. The result, Leppert maintains, was an ideal musical education for men that was theoretical. In contrast, a largely practical music education for women aimed at containment by producing performance abilities on keyboard instruments for domestic consumption (67) in private spaces where women might engage for their own pleasure and assert their own agency but under circumstances in which music's compensatory negative dialectics were constantly reasserted (Leppert 2011, 70).

Approaching the sonorities of the photograph with Leppert, I am to consider the photograph through the sight of the body's labour to produce sound. Aligned with Leppert's (1997) argument - that images are produced in such a way that 'their meanings will be congruent with those produced by sight and sound together in the lived experience of the original and intended viewer' (Ibid., xxi - , I am to attend to the arrangement of bodies and of space and to what these arrangements might denote about music as an activity. I am to consider the labour of the bodies to produce sound, including lines of sight, and whether (and if so how) this labour to produce sound in the space of a girls' school might be said to work as a form of containment for women.

In thinking through the sonorities of the photograph with Leppert, this image is both like and unlike the iconography of the class photo. I recognise the regularities of the school photograph to which Burke/ Ribeiro de Castro (2007) alert in their argument that school photographs perform school through technical, artistic, professional and cultural processes. In the arrangement of the (all-female) bodies in the photograph are the familiar rows of pupils organised in symmetries of age and size. But the gaze of the girls in the photograph is not oriented outward towards the camera as in the class photograph. Their gaze is towards the woman who stands ready to conduct. Her back is to the camera, denoting the play of official relationships through which the sounds of music-making have come to be arranged in the European classical tradition. Lines of sight more firmly fixed as visible centre of attention on the figure of the woman denote her authority as conductor *and* teacher. The official line of communication from composer (his/her 'voice') (Small, 2011, 80) to the girls assembled to sing and to the girl-at-the-piano run through the woman who stands to conduct. Her music stand, with tripod legs screwed down low, gives unimpeded lines of sight between her eyes and those of the girls and will lend visibility for them to the work of her hands (but not for the photograph viewer). These hands will blend sounds from individual girls into a sonorous ceremony and a unified texture directed towards outside listeners through artful conducting that will set vibrations of air oscillating from an otherwise "silent" body. In a carefully positioned sonic sub-

architecture (Small 2011, xii), the arrangement of bodies is framed by the stage and re-framed by the photograph (and its frame) to denote the school hall as auditorium - a space for listening and not talking back that is separated from the choreographies of corridors and classrooms that pattern sonic and pedagogic relationships in particular ways. In this space as auditorium the girl-at-the-piano, each girl who will sing, and the conductor/teacher, are positioned to take their place in a configuration of space and an arrangement of bodily labour to produce sound that inducts into the behaviours and relationships of performance and auditory (bourgeois, white) spectatorship expected in the Western concert hall (Small 2011, 14). But this space is not just an auditorium. It is a multi-purpose place of assembly and a space for looking, listening and paying attention. While all the figures are female and wearing dresses, the uniformity of dress together with the crest above the stage marks aspiration around academic performance and distinction. In thinking with Leppert about the sight of sound and the bodies that labour to produce sound the photograph performs both school *and* the pedagogical relationships of European professional performance traditions in a female educational space that denotes both the containment and possibilities of girls' single-sex education in crossing boundaries of private and public.

But how might the relation of sound and touch inflect a reading of sonorities in the photograph? I turn now to consider Davies' materialist analysis of sound, touch and bodily comportment.

2) Thinking through the touch of sound

The hands of the girl-at-the-piano are just out of sight. The comportment of her arms suggest hands placed to touch piano keys and activate them to sound. Deploying a materialist approach to the relation of sound and touch Davies (2014) traces how eighteenth and nineteenth century pedagogical and anatomical manuals turned touching the piano keys into a audible rhetoric of touch as the body was anatomised through processes in which music became a form of induction into the acquisition of hands (2). Davies notes the shifts in what was thought to constitute correct touch and correct bodily comportment when seated at the piano as attention in medical and pedagogical circles was increasingly paid to the anatomy of hands (6). Here touch in the habituation of the body's motor memory was written into the body by repetitious routines of piano practice and low level pain to produce particular inflections of sound through bodily regimes constituted as pianistic technique.

Davies discusses how from the 1820s and 1830s methods to control pianistic deportment, human anatomy, and orthopaedic medicine, met in the hand-guides, and specifically in the chiroplast (a wooden rail as device for correction placed horizontally above the keys) that demonstrated the play of science, objectivity and technology in the acquisition of hands and fingers and in placing various and shifting forms of expression deep in the body (6, 109, 182). Davies discusses how 'the command of fingers' built on forms of associationist pedagogy in the writings of David Hartley, Étienne de Condillac, and treatise on the education of sensible function (56). 1830s notions of neurophysiology targeted the operation of the 'sympathetic nerve', linking the hand to questions of agency, volition and selfhood, with a greater focus on sensibility (45, 50, 55). 'Fingering' became the art of practice to 'enliven' the 'life of the fingers' and make piano keys 'sing'. The pianist was to cultivate an 'immense catalogue or array of finger touchings, for the hand was thought to be open to sensory environments that aligned with nineteenth century sensibilities and localised somatic agency into 'individualised or sentient fingers' (54, 59, 65). Others in the 1830s sought the power to divide the

hand. As a 'shifting geography of knotted muscles, tendons, torsions, transversions and tensions' (114), the hand was 'cut up' and anatomised, dividing the fingers in order to cultivate 'voice' by sounding two or three textures at once (96). Relations of sound and sight were reconfigured as the piano was placed side on to the audience in order to display the pianist and enable audiences to observe how different passages were 'fingered in a sonic spectacle to dazzle audiences' (99, 105) as they both looked *and* listened to the 'exemplary' hands that were thought to indicate character and eloquence, cognitive functions and the personality of performers (10, 12). Pedagogies began to stress desires, drives, instincts, intentions and volition as hands came to 'have feelings' rather than to 'feel' and to express the romanticised personality of the individual (165, 167). In the mode of the new health sciences piano teachers were to focus on intimate knowledge of each student and on care for the student's body and soul as sonic performance was spiritualized in pursuit of artistic purity (172, 178).

Approaching the sonorities of the photograph with Davies I am to consider the school photograph through a materialistic technique around sound and touch and the acquisition of hands and fingers to make keys sing. I am to consider piano keys activated to sound through a corporality that is 'artful and actual', 'acquired' and 'theatrical' in which the body's 'panoply of potential expressive truths' are to be made '*real*' through pedagogies that embraced 'assiduous cultivation, placement and discrimination' (5, 7). Davies' material technique situates the hands of the girl-at-the-piano as active sites of sonority and of contested and refashioned corporeality through bodily regimes that constitute both care *and* exploitation of the body in pursuit of what is considered the perfect sound. Deploying Davies material technique suggests I pay attention to hands as body parts that are highly disciplined to produce particular inflections of sound through theories, keyboard pedagogy and practice geared to invite audiences to listen and to enjoy (106, 117). It suggests, too, that I consider the hands of the girl-at-the-piano as objects to be heard *and* seen.

Thinking through the sonorities of the photograph with Davies, I note that the girl-at-the-piano sits side-on and prominently in the photograph, resonating with how European concert audiences were encouraged both to look and listen to 'exemplary' hands (12). The gaze of the girl-at-the-piano is drawn away from her hands at the point when the photo was taken. Turned towards both the conductor and the music rest, her gaze signals the 'effortless' habituated movement and agility of hands able to make piano keys 'sing' by touch independently of vision. Thinking with Davies, the hands and fingers of the girl-at-the-piano have been schooled as 'singing machines' to be heard and viewed (2) as they glide 'effortlessly' across keys, masking the labour of physical effort in implanting the work of sound in fingers, hands and bodily memories through piano practice and regimes of finger technique.

But what of hearing in relation to sound, sight and touch? In the following section I consider the relation of sound, hearing, sight and touch through Sterne's (2003) discussion of audition and its implications for reading the sonorities of the photograph.

3) Thinking through the hearing eye

The gaze of the girl-at-the-piano is turned partly towards the piano's music rest, signalling the place of vision in sound's musical score - the printed music notation as material object - and to shifting understandings of hearing linked with the visual and cultivated as audile technique through

aural or 'ear training'. As Sterne (2003) notes, ear training, based on a differentiation between hearing and listening, built on understandings shaped from the 1800s when hearing was differentiated into audition (a passive - or receptive - form of hearing) and auscultation (the active form of hearing). By the turn of the nineteenth century, hearing was being constructed in medicine as a physiological notion while listening was becoming a practical-social construct (100). Late eighteenth and nineteenth century experimentation transformed sound and hearing into objects of knowledge and hearing into a mechanical function that could be isolated and abstracted from the other senses and the human body itself (23). Through the development of audile technique as a set of related practices 'pertinent to, or received through the auditory nerves' (96), medical and theoretical knowledge connoted listening by articulating it to notions of science, reason and rationality in practices that could be learned as technical skill (93, 96).

Shifts in audile technique around 'inner hearing' accompanied a turn in music education in England away from the ornamental pursuits to be cultivated in the girl-at-the-piano and towards class music teaching as an intellectual education of the senses (McCrone 1988). Built on notions of 'inner hearing', listening as directed learned activity and cultural practice required hearing (as physical and physiological activity and form of receptivity) that was not reducible to hearing (Sterne 2003, 19, 96). Inter-war 'democratic' whole-class music pedagogies taught in girls' secondary schools in England (as well as to boys) aimed to fashion the girl pupil-with-the-good-ear into the (white) woman-who-listens. Pedagogical texts promoting aural training initiated pupils into the secrets of music's symbolic grammar through audile technique that exhorted girls to 'observe with the ear' and 'hear with the eye' (Goodman/Jacobs 2008). As with hands, ears could be trained through regimes of audition that produced 'skilful' bodies as audition was shaped into a 'bourgeois' form of practice that demarcated private, individual, acoustic space linked with forms of middle-class sensibility and compatible with regimes of audition in emergent areas of women's professional work (Sterne 2003, 24, 95, 98, 138).

Approaching the sonorities of the photograph with Sterne (2003), I am to consider the sonorities of the photograph through the gaze of the girl-at-the-piano towards the music rest - the place of the musical score, composed through an assemblage of literacy, language and 'rudiments' of music. With its five-ruled staff, scales, signatures, keys, intervals, note values, meter, dynamics, phrasing, attack, exercises, crescendos and diminuendos, this score remains acoustically silent for the uninitiated. I am to consider how, for those skilled in audile techniques of observing with the ear and hearing with the eye, the score as assemblage resounds (in silence) in the spaces of individualised minds and bodies and is realised as sonority through musical performance.

Thinking through the sonorities of the photograph with Sterne, the gaze of the girl-at-the-piano towards the music rest situates her as the pupil with the 'good ear', capable of individualised 'inner hearing' as a form of 'active listening' that is distinguished from the 'ordinary hearing' in which 'experience', it was argued, deteriorates into 'mere sensuous enjoyment' (Goodman/Jacobs 2008). As she begins to perform, the girl-at-the-piano will demonstrate her audile technique as she decodes the (so-called) inner meanings enshrined in the musical 'score'. Through interpretation and the fidelities of a well-executed performance, she will make these meanings sound for the 'distinterested' contemplation of individual listeners.

Thinking through the sonorities of the photograph with Leppert, Davies and Sterne directs acoustic histories to sensory histories of the body. But what of the sound waves that will reverberate as hands touch keys, girls sing and the body of the conductor/teacher sets air oscillating? I turn now to think with Barad (2007), Bennet (2004, 2009) and Ingold (2011, 2015), who provide pointers to how the sonorities of the photograph might be considered through an analytic around sound as material.

4) Thinking through sound as material

Barad (2007) argues from within quantum physics that the encounter of sound waves generates the phenomena of diffraction, or interference, as sound waves combine when they overlap and apparently bend and spread when they encounter an obstruction. Barad notes that a diffraction or interference pattern from this encounter incorporates the trajectory of the wave.⁶ Waves, as Barad reminds, are disturbances that cannot be localised to a point but are propagated in a medium. When they overlap at the same point in space the resultant wave is a combination of disturbances (a superposition) created by each wave individually that can be larger or smaller than either the component wave. As their components relate, boundaries and properties of waves emerge in intra-action⁷ as phenomena and become determinate' (76, 139-40). Sound in Barad's world is agentic within a 'dynamic process of intra-activity and materialisation' that points to 'the ongoing flow of agency through which a part of the world makes itself differently intelligible to another part of the world' (140).

With Bennett (2004, 361) sound is located within 'a dynamic flow of matter-merge' that she argues, tends to settle into various bodies', human and non-human, that often make connections in natural-cultural-technological assemblages. For Bennett, 'the lively energy and/or resistant pressure that issues from one material assemblage and is received by others' (365) emphasises the closeness and intimacy of humans and non-humans. For Ingold sound is neither physical nor psychic but atmospheric and sound pitches (throws, casts into the world) and peals, rather than travelling from source to recipient as from loudspeaker to ear. It is a quality of experience that engages corporal and celestial poles of hearing - the one sensing, the other sensible - which, when they collide, generate the experience of sound (107-8).

Approaching the sonorities of the photograph with Barad suggests I pay attention to intra-actions and diffraction. With Bennet, I am to attend in the photograph to the vibrant matter of things (Bennet, 2004, 2009), and by consulting non-humans more closely I am to note the permeability of inert matter and the vital energy between the animate and inanimate (Jones/Hoskins 2016, 84). Approaching the photograph with Ingold suggests I consider how the vibrancy of matter animates the auditory atmosphere.

When thinking through the sonorities of the photograph with Barad, Bennet and Ingold, the school hall denotes a porous space of reverberation. As voices and the piano begin to vibrate together with the materiality of the space they will generate multiplicity. Sound here is spatial *and* temporal

⁶ Barad discusses the physics of diffraction, including sound waves (2007, 80ff)

⁷ For Barad, interactions occur between already-established and separate entities, but intra-actions occur as relations between components (2007 179).

event of diffraction. As the sound waves travel they will be changed by each interaction with the environment, including among bodies; for bodies lend dynamic to acoustical play, contributing to the modulation of sound, its 'reverberation, its volume, its intensity and ultimately to what it may communicate' (LaBelle 2015 xii). This sonic sub architecture differs from the bounded sonic-sub architecture suggested by analysis of the sight of sound. Here, in contrast, sound will mingle with the body of the girl-at-the-piano, and the bodies of each girl who will sing, as well as the body of the conductor - and bodies and sounds will intra-act materially constituting phenomena. As hands are brought to resistant surfaces of the piano keys, fingers, ivory, wood, and the metal of strings and pins, will vibrate together, mingling and reacting with the wood of the floor, glaze of the windows, velvet of stage curtains, cotton of dresses, leather of shoes, metal of music stand and much more. Vibrating together they will be 'inveigled into the midst of the field of audition, as sound swirls in the in-between of source and recipient' (Ingold 2015, 109). As the piano plays, the girls sing and the teacher conducts, sound will escape from the hall into nooks and crannies of corridors, classrooms and bodies absent from the photograph. As sound returns to ephemerality it will become a bundle of affects coupled with resonant air as piano, voices, bodies and materials sound, reverberate, flow, mix and mutate in the current of materials and the infinite of the auditory atmosphere (Ingold 2011, 25-6, 61; 2015, 109).

But what of the acoustic agency of the photograph itself as it hangs on the wall in my house with its thin black frame, framing the frame of the photograph? When thinking with Barad, Bennett and Ingold the photograph constitutes the congealed input of photographic technique and photographer, my interpretive gaze, and the hundreds of elements that come together in the making of this record of sonority as an entanglement created within swirling meaning systems around girls' education, girls' achievements and girls' futures. Can we say, as Shafer (2004, 7) suggests, that the surface of the photograph is silent? Or that the photograph hangs silently on my wall?

And what about my position as both researcher *and* girl-at-the-piano? I turn now to consider the researcher-who-is-girl-at-the-piano in these readings of sonority. I do so by thinking first with Alfred North Whitehead's (1929) notion of the bifurcation of nature and then with Barad's intra-action. I thread into this discussion thinking on the body from Elizabeth Grosz, to whose work I return in the concluding section.

5) Thinking through researcher positioning

Leppert (2007) uses the language of separation in his argument that the image 'stands off, separates itself from us like something to be studied' (29). Leppert's language of separation illustrates the coming-to-be of dualisms that separate along lines that Whitehead (1929, 1938) refers to as a bifurcation of nature that does not exist as a concrete entity but emerges in what he terms the forms of the form of thought. Leppert's (2007) analytic around the sight of sound and the body's labour to produce sound constitutes a regime of visibility that to paraphrase Halewood (2013, 13) separates substance on one side and the qualities of substance on the other, the 'world-as-it-is' and information about the 'world-as-it-is'. When thought through Whitehead's notion of bifurcation, Leppert's analysis of the 'sight of sound' emerges as a reflection that bifurcates that which is represented (the object) from that which is representing (the subject). This separation distances the researcher, for the sight of sound to be observed 'exists independent of the eye of

researcher and their gaze and the researcher's perception of it' as Schneider (2002, 467) would suggest.⁸ As the raft of scholarship on the gaze, and on the mirror that reflects illustrates, applying the sight of sound as research technique requires an act of gazing through which the researcher is distanced from the girl-at-the-piano.

Thinking through Davies' (2014, 182) refiguration of the body as sound and its expression (placed in the body through science, objectivity and technology)⁹ along with Elizabeth Grosz's (1994, 116f) discussion of the tracing into the flesh through pedagogical and medical texts, Davies' (2014, 182) reconfigurations suggests a bifurcation around materiality that also creates distance between the researcher and the girl-at-the-piano. Thought along with Grosz, Davies builds on a view of materiality that sees interactions and linkages on the surface of the skin and various body parts 'actively producing the body as historically specific, concrete and determinate' through incisions and inscriptions of sonority that produce the (illusion or effects of) depth and interiority, with different degrees of permanence. This position works with a model of the body as a tabula rasa on which sonority works, whereby ideas of inscription help explain how the body - once it is constituted as such - is transcribed and marked by sonority. But this type of stance, as Grosz argues, raises questions around the pre-discursive - what is it that produces the blank page - or produces the body as such that will take on manifestations of sonority? Reading through Ingold (2011 12, 26; 2015 108) suggests that in Davies' approach to the sonorities of the body, sound as material is reduced to physical, neurological and physiological aspects. This constitutes what Ingold (2011, 62) terms an inversion in which life remains on the inside and the world on the outside, a bifurcation which distances the researcher from the girl-at-the-piano.

Sterne (2003) argues that sound and hearing as form of contemplation constitute an audio-visual litany that he traces to an Ensoniment accompanying the Enlightenment when, he maintains, the sense of hearing became an object of contemplation and a tool of rationality (2, 30, 93). This contemplation repeats dualisms of thought and nature, subject and object, which bifurcates to separate the researcher from audition along lines that Popkewitz (2013) associates with a 'homeless mind'. Forms of audile technique inculcated in inter-war class music education England also illustrates the separations that Gustafson (2014) illustrates running between mind and matter in styles of reason underpinning shifting forms of school music education that repeat Ingold's notion of inversion to distance researcher and girl-at-the piano.

Ingold (2011) argues that far from being enfolded into the body, sound sweeps the body up into its own currents to be ensounded as it is immersed in the fluxes of the medium (135). The diffraction of sound, and the entanglement of the human and the non-human espoused by Barad and Bennet calls into question dualisms that place nature on one side, culture on the other and distance the researcher from that which is researched. The entanglements through which diffraction as interference is understood is about responsibility to the intra-actions of which the researcher is a part (Barad in Dolphijn/van der Tuin 2012, 52). Barad (2007) notes, "intra-action" signifies *the mutual constitution of objects and agencies of observation within phenomena* (197, italics in original). Barad is explicit about the researcher as an intra-active element in 'knowledge-making practices'

⁸ Barad quoted in Dolphijn/van der Tuin (2012, 52) notes that to see your image in a mirror there is necessarily a distance between you and the mirror and that objectivity is about mirror images of the world.

⁹ For discussion of the tracing into the flesh through pedagogical and medical texts, see Davies (2014, 182).

(here of sonority). With Barad, the researcher and photograph intra-act in the making of (a sonorous) analysis and research techniques (as instruments) constitute boundary-drawing practices and specific material (re)configurings that come to matter (197, 247, 340). Unlike the distancing embedded in forms of the form of thought running through Leppert, Davies and Sterne, with Barad attention is drawn to the intra-action of researcher, girl-at-the-piano, and analysis of the sonorities of the photograph. From an intra-active stance, what is at stake is what can be understood of the sonority of the photograph as trace-in-intra-action and how diffraction interferes to unsettle researcher analytics and interpretations.

Diffraction and intra-action point to states of indeterminacy that raise questions about how historical change is conceptualised, to which I now turn. In the concluding section I consider a line of thinking around the relation of intra-action and historical change prompted by thinking through the acoustic as vibrant, diffractive material. This discussion is framed through an understanding of indeterminacy that resonates with Barad and Grosz and with the writings of Bergson.

6) Thinking through sonorous histories and indeterminate futures

Barad (200) notes that with intra-action, interior and exterior, past, present and future, are 'iteratively enfolded and reworked, but never eliminated (and never fixed)' (179). Rather, they reconfigure the possibilities for change in the topology and dynamics of power in a space of possibilities that does not represent a homogenous fixed, uniform container of choices (183, 246). For Barad (2007), '[r]eality is an ongoing dynamic of intra-activity,' (200 italics in original) in which past, present and future are always being reworked, as 'phenomena are diffracted and temporally and spatially distributed across multiple times and spaces' (Barad in Dolphijn/van der Tuin 2012, 68). Dynamics of intra-activity are not marked by an exterior parameter called time; nor do they take place in a container called space. Rather, '*iterative intra-actions are the dynamics through which temporality and spatiality are produced and iteratively reconfigured in the materialization of phenomena and the (re)making of material-discursive boundaries and their constitutive exclusions*' (Barad 2007, 179 italics in original).

Both Barad and Grosz (2010) draw on a notion of indeterminacy that Grosz outlines in terms of an analysis of freedom and a vision of histories for a feminist future (2000, 2010). For Grosz, freedom for women is about innovation, invention and actions, processes and events that are not contained within, or predictable from, the present and like Barad (2007),¹⁰ she draws on a notion of indeterminacy. Grosz follows a line of thinking from Bergson in which indeterminacy is Bergson's 'true principle' of life, and the condition 'for the open ended action of living beings', which makes indeterminacy about 'ways in which living bodies are mobilised for action' that cannot be specified in advance (149). Indeterminacy for Bergson, notes Grosz, spreads from the living to the non-living through the virtuality that the living brings to the inorganic, the potential for the inorganic to be otherwise, to lend itself to incorporation, transformation and energetic protraction in the life and activities of species and individuals. But equally, notes Grosz, the material universe 'must contain within itself the very conditions for the indeterminacy of the life which it generated' (150). The past, here, is not 'a diminished or receded former present, a present that has faded into memory or has carried artefacts that intrude in the present' but is 'the virtual that coexists with the present'. It 'is always already con-

¹⁰ Barad's (2007) discussion of Indeterminacy is threaded through her text.

tained in the present, not as its cause or its pattern, but rather as its latent virtuality, its potential for being otherwise' (Grosz 2000, 1020).

Thinking through the sonorities of the girl-at-the-piano with Barad, Grosz, Bennet and Ingold is to reframe histories of girls' education as a step towards 'an *indeterminable* future open to women' (Grosz 2005, 193, italics in original). It is to move beyond a narrative based on struggle around the rights and needs of female subjects subjugated by male subjects; and it is to move beyond the politics of identity and the politics of location that have configured accounts of girls' education, and which, however useful, Barad (2007, 246) argues, have been circumscribed by a conception of power that flattens features of its dynamics. As Grosz (2000) notes, reframing histories around an indeterminate future is an idea of a future 'unconfined by the chains of the determinism that constrain the future directly through the past, that is, a future yet to be made' (1017). Diffractive intra-active sonorous historical accounts of the girl-at-the-piano point to the production of conceivable futures that are understood not as 'that which is similarly contained in the present' but, rather, 'that which diverges from the present, one ... unpredicted from within the present' (1020). Diffractive sonorous accounts suggest a history of possibilities that recasts power-over into the dynamics of power-to and in Grosz' words, provides 'an opening put to a life that is not exhausted in its pastness' (1020).

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